

(No Model.)

J. W. HAZELL.
WATER HEATER.

No. 555,767.

Patented Mar. 3, 1896.

Fig. 1.

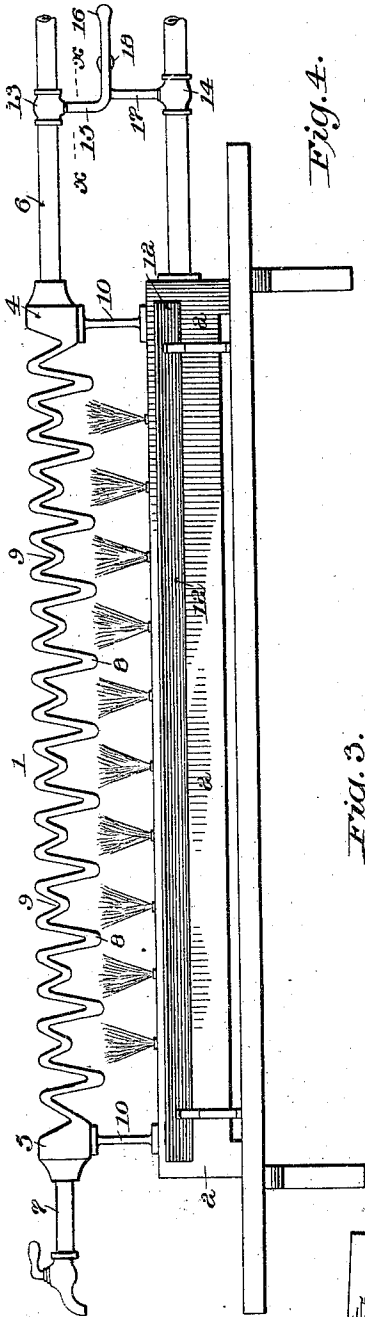


Fig. 4.

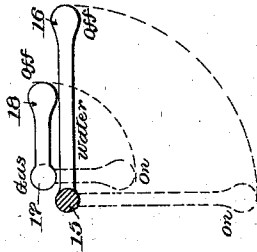


Fig. 3.

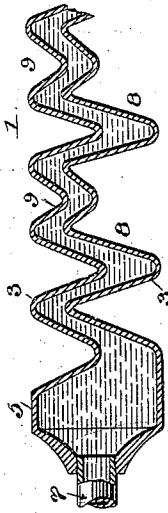


Fig. 6.

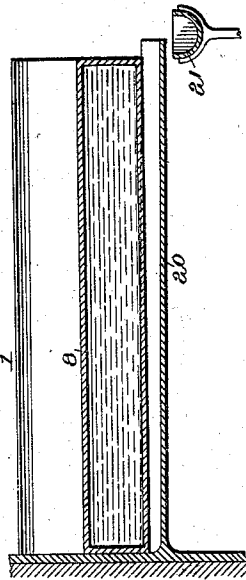
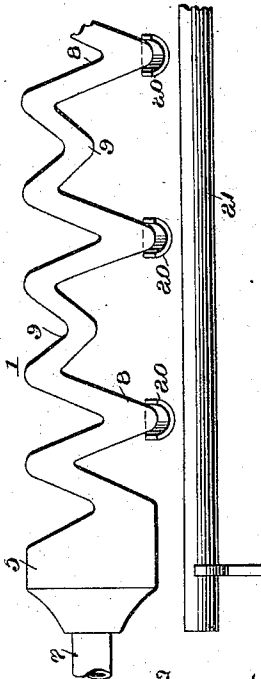
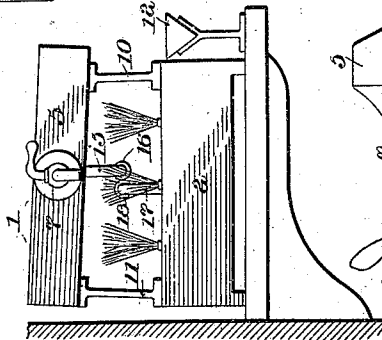


Fig. 5.



Witnesses
Arthur Cobley
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Fig. 2.



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UNITED STATES PATENT OFFICE.

JOSEPH W. HAZELL, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE COURT-
LAND MACHINE COMPANY OF BALTIMORE CITY, OF SAME PLACE.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 555,767, dated March 3, 1896.

Application filed February 21, 1895. Serial No. 539,266. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. HAZELL, of Baltimore, State of Maryland, have invented a new and useful Improvement in Water-
5 Heaters, of which the following is a specification.

My invention has reference to water-heaters, and it consists of an improved apparatus, compact in form, in which the water to be
10 heated is passed through a narrow sinuous or zigzag passage in a metallic corrugated casing, subjected to the influence of heat.

The invention consists also in certain details of construction incidental to the above
15 arrangement, which will be fully described in the specification and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved heater.
20 Fig. 2 is an end view of the same. Fig. 3 is a centrallongitudinal section. Fig. 4 is a horizontal section on the line *xx* of Fig. 2, showing the arrangement of the valves for controlling the supply of water and gas. Fig. 5
25 is a front elevation of a modified arrangement for draining off the water of condensation from the outer surface of the casing. Fig. 6 is a transverse sectional elevation through the same.

30 Referring to the drawings, my improved heater consists of a corrugated metallic casing 1, containing a zigzag or sinuous water-passage therethrough, the said casing being sustained in slightly-inclined position over
35 a heater 2 in such position that the under outer surface of the casing will be subjected to the action of the flame. The casing is formed of two corrugated metallic plates 3, placed side by side a slight distance apart
40 and connected at their edges by suitable filling or connecting pieces located between the plates, the arrangement being such that a narrow closed passage-way is left corresponding to the corrugations in the plates. The case
45 comprises in effect a series of flat inclined hollow sections, which are joined end to end, forming conjointly a continuous zigzag passage from one end of the casing to the other. As a result, when the water is passed through
50 this passage it assumes a thin film-like form which, when the side of the casing is sub-

jected to the action of the heating-flame, is quickly heated at every point from one end of the casing to the other. At opposite ends
55 the water-passage connects with two chambers or reservoirs 4 and 5, the former being provided with a water-supply pipe 6 and the latter with a discharge-pipe 7.

In order to provide for the greatest amount of heating-surface within the smallest space,
60 and in order to permit the flame from the heater to act most effectually on the surface of the corrugated casing, I form the casing with long and short corrugations or bends 8 and 9, as plainly shown in Fig. 3, the shorter
65 bends, 9, being located between the upper ends of the longer ones. In this way I secure an extended course for the passage of the water, and at the same time, owing to the comparatively wide space between the long
70 corrugations, the flame will reach upward between the same and effectually heat their surfaces and those of the shorter corrugations. The long or deep corrugations in effect form
75 inverted pockets for the retention of the heat of the flame, so that the heat is more effectively applied and utilized.

It will be observed that were the casing formed entirely of the longer corrugations the spaces between them would be narrow,
80 and consequently the flame would not reach upward in the angles at the top.

In the drawings I have shown the heater in the form of an ordinary gas-burner of the Bunsen type, the water-casing being sustained
85 thereover by four standards 10 and 11, the latter being greater in height than the former, so that the casing is sustained at a slight inclination. The purpose of this is to cause any
90 water of condensation which may collect on the exterior of the casing to be drained to its lower edge, where it is received in a trough 12 extending from one end of the casing to the other.

The water and gas supply pipes are provided with suitable valves 13 and 14, respectively,
95 the former being provided with a stem 15 extending downward about midway of the distance between the two pipes, where its end is bent laterally at right angles to form a
100 handle 16. The valve 14 of the gas-pipe is likewise provided with a stem 17, which ex-

tends upward and terminates adjacent to the handle 16, at which point it is bent laterally to form a handle 18. The handle 16 is greater in length than the other one and is arranged in advance of the same, the two extending side by side, as plainly shown in Fig. 4. As a result of this arrangement, when the heater is to be used it is not possible to open the gas-supply without also admitting the water, nor is it possible, on the other hand, to cut off the water-supply without also and at the same time shutting off the supply of gas. In this way there will be no danger of injuring the casing by heating the same when there is no water present. When the heater is to be used the handle 16 is turned in the direction indicated by the arrow, thus admitting the water, after which the handle 18 is turned in the same direction to turn on the gas. When the supply of gas and water are to be cut off the handle 16 is turned in the opposite direction and will contact with the other handle and push the same before it, thereby simultaneously cutting off the supply of gas.

In operating my heater the supply of gas and water are turned on in the manner described and the water will be admitted to the reservoir 4, whence it will pass through the sinuous passage in the casing, and in flowing therethrough will be momentarily retarded at each angle or turn of the passage, and finally will emerge at the opposite end in the reservoir 5 from which it may be drawn for use. The water in its passage is in the form of a thin film or sheet and the flame playing on every part of the exterior surface of the casing will subject the water to an intense heat, so that by the time it issues at the opposite end of the casing it will be heated sufficiently for bath or other purposes.

Instead of sustaining the casing at an inclination to drain off any condensed water which may accumulate on the outer surface thereof, I propose in certain cases, as shown in Figs. 5 and 6, to set the casing in a truly horizontal position and to sustain beneath the lower edges of the long corrugations a series of inclined troughs 20, the said troughs extending transversely of the casing and leading downward to a longitudinally-extending trough 21 into which they all discharge. These transverse troughs are located close to the edges of the corrugations and incline just

enough to shed the water, so that they will not interfere with the action of the flame on the casing.

Having thus described my invention, what I claim is—

1. A water-heater comprising a casing made up of oppositely-inclined hollow sections joined end to end, and forming a continuous zigzag passage from one end of the casing to the other, in combination with a connection for supplying water to the casing at one end, means for withdrawing it at the opposite end and means for applying heat to the side of the casing.

2. The combination with a casing having a corrugated surface and an internal zigzag passage extending parallel to the corrugated surface, of reservoirs at opposite ends of the passage, a connection for supplying the water to one of the reservoirs, means for withdrawing the heated water from the other reservoir and means for applying heat to the side of the casing.

3. In a water-heater the combination with a series of burners arranged side by side, of a connection for supplying gas to the same, a valve for regulating the flow of the gas, a horizontal hollow casing sustained over the burners having a corrugated under surface, and a zigzag passage therethrough running parallel to the bottom of the casing, reservoirs at opposite ends of the passage, a connection for supplying water to one of the reservoirs, means for controlling the flow of water, and means for withdrawing the heated water from the other reservoir.

4. In a water-heater the combination with a horizontally-extending shell or casing having on its under surface long and short corrugations, and an internal zigzag passage extending parallel to the under surface, of a burner beneath the casing, a connection for supplying water to one end of the casing and means for withdrawing the heated water from the other end.

In testimony whereof I hereunto set my hand, this 15th day of February, 1895, in the presence of two attesting witnesses.

JOSEPH W. HAZELL.

Witnesses:

W. R. KENNEDY,
F. S. ELMORE.